What Is Claimed Is:

1. A reciprocating screw injection unit having a cyclic operating period, comprising:

an axially translating screw mounted within a barrel, the screw having associated therewith a non-return valve downstream of which a volume of melt can, in use, be accumulated;

a first actuator arranged to effect axial movement of the screw relative to the barrel and to generate, in use, back-pressure;

a second actuator coupled to the screw to control, in use, rotational speed of the screw; and

a controller for controlling operation of the screw and the first actuator, the controller arranged to set an axial position for the screw that defines the volume of melt to be accumulated downstream of the non-return valve by effecting, in use, an increase in the back-pressure to prohibit any further increase in the volume for melt accumulation and to render a recovery rate for the screw as being substantially zero and wherein the controller is arranged to ensure that the screw, during use, rotates substantially continuously over the entire cyclic operating period.

2. The reciprocating screw injection unit according to claim 1, wherein the controller causes, during each injection cycle, selective variation of at least one of:

a) the back-pressure; and

b) the rotational speed of the screw;

thereby to control axial translation of the screw and selectively and dynamically to vary the recovery rate of the injection unit during the injection cycle.

3. The reciprocating screw injection unit according to claim 1, further including a pressure transducer coupled to the controller.

4. The reciprocating screw injection unit according to claim 1, further including a screw position transducer coupled to the controller and responsive to the screw, the screw position transducer relaying screw position information to the controller for the purposes of at least one of:

back-pressure control; and

recovery rate control.

5. The reciprocating screw injection unit according to claim 1, further including a screw speed sensor coupled to the controller and the second actuator, the screw speed sensor relaying screw speed information to the controller for the purposes of dynamic recovery rate control during each injection cycle.

6. The reciprocating screw injection unit according to claim 1, wherein the screw has a tip located downstream of and proximate to the non-return valve and the barrel further has a chamber in front of the tip and into which chamber melt accumulates, the chamber having a final volume defined as a sum of a shot size and an injection cushion sufficient to compensate, during injection, for potential back-flow across the non-return valve from the chamber.

7. The reciprocating screw injection unit according to claim 6, wherein the rotational speed of the screw, in use, is constant.

8. The reciprocating screw injection unit according to claim 1, wherein, in use, the rotational speed of the screw is at a first speed during a recovery phase for the screw and, temporarily, variable towards a second speed for at least a portion of an injection phase, the second speed being lower than the first speed.

9. The reciprocating screw injection unit according to claim 1, wherein screw rotation, in production use, is always above zero revolutions per minute.

10. A reciprocating screw injection unit developing injection pressures for injection purposes, the reciprocating screw injection unit containing a screw within a barrel having a shot chamber into which molten material is accumulated, the injection unit having a an adjustable recovery rate, the reciprocating screw injection unit comprising:

means for dynamically varying revolutions per minute of the screw within the barrel;

means for adjusting back-pressure developed by the injection unit to control location and axial movement of the screw relative to the barrel; and

means for controlling the recovery rate during screw recovery and injection phases, said means for controlling operational to effect the means for dynamically varying and the means for adjusting back-pressure;

and wherein, during plasticizing, the rotational speed of the screw is above zero for a substantial period of the entire operating cycle.

11. A controller of an injection molding machine, the controller arranged, in use, to control axial positioning of a reciprocating and continuously rotating feedscrew through selective control of back-pressure, the controller further

arranged to support and control the development, in use within the injection molding machine, of back-pressure for material injection directly into one of a mold and a runner system.

12. The controller according to claim 11, wherein the controller is further arranged to maintain, in use, a substantially zero recovery rate for the screw during an injection phase, the recovery rate relating to rotational speed of the screw and back-pressure developed, in use, within an injection unit of the injection molding machine.

13. The controller according to claim 12, wherein the controller, in use, causes selective variation of at least one of:

a) the back-pressure; and

b) the rotational speed of the screw;

thereby to control axial translation of the screw and selectively and dynamically to vary, in use, the recovery rate during an operational cycle of the injection unit.

14. The controller according to claim 13, wherein the controller is configured, in use, to decrease temporarily the rotational speed of the screw during an injection phase of the operation cycle relative to a rotational speed of the screw during a recovery phase of the operational cycle.

15. The controller according to claim 14, wherein the controller is responsive, in use, to sensed pressure, location and speed signals associated with an injection unit and the controller, in use, acts substantially to maintain a zero recovery rate during an injection phase of the operation cycle.

16. A method of operating a reciprocating feed screw of an injection unit having a non-return valve associated therewith, the non-return valve permitting the injection unit to operate at injection pressures, the method comprising:

rotating the reciprocating screw at a speed above zero revolutions per minute for substantially the entire injection molding cycle.

17. The method of operating the reciprocating feed screw according to claim 16, further comprising:

in a chamber downstream of a non-return valve of the feed screw, accumulating melt until a desired volume is accumulated;

increasing back-pressure in the injection system both to establish a substantially zero recovery rate for the feed screw and to prohibit any further increase in the volume for melt accumulation.

18. The method of operating the reciprocating feed screw according to claim 17, the method comprising:

further increasing back-pressure within the system to produce injection of the melt from the chamber into a mold.

19. The method of operating the reciprocating feed screw according to claim 18, the method comprising:

sensing at least one of a pressure environment, screw location and rotational speed of the screw; and

controlling axial translation of the screw and selectively and dynamically varying the recovery rate of the injection unit during the injection cycle in response to corresponding ones of the pressure environment, screw location and rotational speed by adjusting at least one of:

a) the back-pressure; and

b) the rotational speed of the screw.

20. The method of operating the reciprocating feed screw according to claim 17, the method comprising:

accumulating melt in the chamber until the volume of accumulated melt is equal to a sum of a shot size required for molding a part and an injection cushion volume sufficient to compensate, during injection, for potential back-flow across a non-return valve upstream of the chamber.

21. The method of operating the reciprocating feed screw according to claim 16, the method comprising:

operating the screw at a first speed during a recovery phase for the screw in which melt is accumulated; and

temporarily operating the screw at a second speed for at least a portion of an injection phase, the second speed being lower than the first speed.

22. The method of operating the reciprocating feed screw according to claim 16, wherein rotation of the reciprocating screw at a speed above zero revolutions per minute occurs over the entire injection molding cycle.

23. The method of operating the reciprocating feed screw according to claim 16, wherein rotation of the reciprocating screw can be reduced to zero for a time of less that about 30% of a total cycle time, preferably less than 20% of the total cycle time and most preferably less than 15% of the total cycle time.

24. A computer program element comprising computer program code means to make the computer execute procedure to:

rotate a reciprocating screw of an injection unit at a speed above zero revolutions per minute for substantially an

entire injection molding cycle and preferably at least 60% of the injection cycle.

25. The computer program element according to claim 24, further comprising computer program code means to make the computer execute procedure to:

accumulate melt in a chamber downstream of a non-return valve of the feed screw until a desired volume is accumulated; and

increase back-pressure in the injection system both to establish a substantially zero recovery rate for the feed screw and to prohibit any further increase in the volume for melt accumulation.

26. The computer program element according to claim 25, further comprising computer program code means to make the computer execute procedure to:

further increase the back-pressure within the system to produce injection of the melt from the chamber into a mold.

27. The computer program element according to claim 26, further comprising computer program code means to make the computer execute procedure to:

analyze at least one of a sensed pressure environment, screw location and rotational speed of the screw; and

control axial translation of the screw and selectively and dynamically vary the recovery rate of the injection unit during the injection cycle in response to corresponding ones of the pressure environment, screw location and rotational speed by causing adjusting of at least one of:

a) the back-pressure; and

b) the rotational speed of the screw.

28. The computer program element according to claim 25, further comprising computer program code means to make the computer execute procedure to:

allow accumulation of melt in the chamber until the volume of accumulated melt is equal to a sum of a shot size required for molding a part and an injection cushion volume sufficient to compensate, during injection, for potential back-flow across a non-return valve upstream of the chamber.

29. The computer program element according to claim 24, further comprising computer program code means to make the computer execute procedure to:

operate the screw at a first speed during a recovery phase for the screw in which melt is accumulated; and

temporarily operate the screw at a second speed for at least a portion of an injection phase, the second speed being lower than the first speed.

30. The computer program element according to claim 24, further comprising computer program code means to make the computer execute procedure to cause, in use, rotation of the reciprocating screw at a speed above zero revolutions per minute over the entire injection molding cycle.

31. The computer program element according to claim 24, further comprising computer program code means to make the computer execute procedure to permit rotation of the reciprocating screw to be reduced to zero for a time of less that about 30% of a total cycle time, preferably less than 20% of the total cycle time and most preferably less than 15% of the total cycle time.

32. The computer program element as claimed in claim 24, the computer program element embodied on a computer readable medium.

33. An injection molding machine including having an injection unit base comprising:

a barrel with an axially translating and reciprocating screw therein, the barrel having a nozzle to support, in use, injection of melt into one of a runner system and a mold, the screw having associated therewith a non-return valve downstream of which a volume of melt can, in use, be accumulated;

a first actuator arranged to effect axial movement of the screw relative to the barrel and to generate, in use, back-pressure;

a second actuator coupled to the screw to control, in use, rotational speed of the screw; and

a controller for controlling operation of the screw and the first actuator, the controller arranged to set an axial position for the screw that defines the volume of melt to be accumulated downstream of the non-return valve by effecting, in use, an increase in the back-pressure to prohibit any further increase in the volume for melt accumulation and to render a recovery rate for the screw as being substantially zero and wherein the controller is arranged to ensure that the screw, during use, rotates substantially continuously.

34. The injection molding machine according to claim 33, wherein the controller causes, during each injection cycle, selective variation of at least one of:

a) the back-pressure; and

b) the rotational speed of the screw;

thereby to control axial translation of the screw and selectively and dynamically to vary the recovery rate of the injection unit during the injection cycle.

35. The injection molding machine according to claim 34, further including a pressure transducer coupled to the controller.

36. The injection molding machine according to claim 34, further including a screw position transducer coupled to the controller and responsive to the screw, the screw position transducer relaying screw position information to the controller for the purposes of at least one of:

back-pressure control; and

recovery rate control.

37. The injection molding machine according to claim 36, further including a screw speed sensor coupled to the controller and the second actuator, the screw speed sensor relaying screw speed information to the controller for the purposes of dynamic recovery rate control during each injection cycle.

38. The injection molding machine according to claim 33, wherein the screw has a tip located downstream of and proximate to the non-return valve and the barrel further has a chamber in front of the tip and into which chamber melt accumulates, the chamber having a final volume defined as a sum of a shot size and an injection cushion sufficient to compensate, during injection, for potential back-flow across the non-return valve from the chamber.

39. The injection molding machine according to claim 38, wherein the rotational speed of the screw, in use, is constant.

40. The injection molding machine according to claim 35, wherein, in use, the rotational speed of the screw is at a first speed during a recovery phase for the screw and, temporarily, variable towards a second speed for at least a portion of an injection phase, the second speed being lower than the first speed.